

(c) 4 antinodes = 2λ
 $\lambda = 2.0 \text{ m}$

$$f = \frac{3.2 \text{ m/s}}{2.0 \text{ m}}$$

$$f = 1.6 \text{ Hz}$$

3. 4 nodes = 2λ
 $2\lambda = 82 \text{ cm}$
 $\lambda = 41 \text{ cm or } 0.41 \text{ m}$

$$f = \frac{v}{\lambda}$$

$$= \frac{6.0 \text{ m/s}}{0.41 \text{ m}}$$

$$f = 15 \text{ Hz}$$

4. 1 antinode = $\frac{1}{2}\lambda$

$$\frac{1}{2}\lambda = 2.0 \text{ m}$$

$$\lambda = 4.0 \text{ m}$$

$$f = \frac{v}{\lambda}$$

$$= \frac{2.8 \text{ m/s}}{4.0 \text{ m}}$$

$$f = 0.70 \text{ Hz}$$

2 antinodes = 1λ

$$\lambda = 2.0 \text{ m}$$

$$f = \frac{2.8 \text{ m/s}}{2.0 \text{ m}}$$

$$f = 1.4 \text{ Hz}$$

3 antinodes = 1.5λ

$$1.5\lambda = 2.0 \text{ m}$$

$$\lambda = 1.33 \text{ m}$$

$$f = \frac{2.8 \text{ m/s}}{1.3 \text{ m}}$$

$$f = 2.1 \text{ Hz}$$

6.9 INTERFERENCE OF WAVES IN TWO DIMENSIONS

PRACTICE

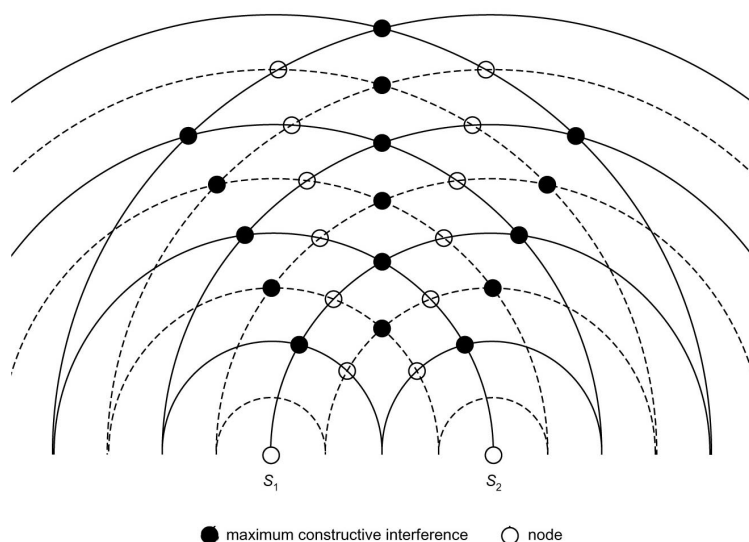
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Understanding Concepts

1. The single straight line of constructive interference is located halfway between the two sources running perpendicular to the axis that joins them.
2. When the frequency of the sources is increased, the nodal lines become very close together and increase in number. This makes it more difficult to see the nodal lines.
3. If the distance between the sources is increased, there are more nodal lines because there is a larger area for the interference of the wave fronts to occur.

Applying Inquiry Skills

4.



Section 6.9 Questions

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Understanding Concepts

1. You would hear a sound with a lower intensity (destructive interference).
2. All the lines of constructive interference are not curved. The line halfway between the two sources is straight.

Applying Inquiry Skills

3. An experimental setup to obtain a two-point interference pattern would be to use one source with the reflecting barrier placed on a line halfway between the two sources. The barrier acts like a mirror where the source of the reflected waves is the virtual image of the one source.

CHAPTER 6 REVIEW

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Understanding Concepts

1. (a) longitudinal vibration
(b) torsional vibration
(c) transverse vibration
(d) torsional vibration
2. 1 cycle = 4 amplitudes

$$A = \frac{14 \text{ cm}}{4}$$

$$A = 3.5 \text{ cm}$$

$$\begin{aligned} 3. \quad f &= \frac{\text{number of cycles}}{\text{total time}} \\ &= \frac{16 \text{ cycles}}{21 \text{ s}} \\ f &= 0.76 \text{ Hz} \end{aligned}$$

$$\begin{aligned} T &= \frac{1}{f} \\ &= \frac{1}{0.76 \text{ Hz}} \\ T &= 1.3 \text{ s} \end{aligned}$$

4. (a) The pogo stick undergoes longitudinal vibration.

$$\begin{aligned} (b) \quad T &= \frac{\text{total time}}{\text{number of cycles}} \\ &= \frac{55\,560 \text{ s}}{122\,000 \text{ cycles}} \end{aligned}$$

$$T = 0.46 \text{ s}$$

$$\begin{aligned} (c) \quad f &= \frac{1}{T} \\ &= \frac{1}{0.46 \text{ s}} \\ f &= 2.2 \text{ Hz} \end{aligned}$$

5. (a) Points A and B would have an instantaneous upward motion.
(b) Points D and E would have an instantaneous downward motion.
(c) Point C would have no motion.

$$\begin{aligned} 6. \quad v &= f\lambda \\ &= (5.0 \times 10^2 \text{ Hz})(3.0 \text{ m}) \\ v &= 1.5 \times 10^3 \text{ m/s} \end{aligned}$$

$$\begin{aligned} 7. (a) \quad f &= \frac{v}{\lambda} \\ &= \frac{5.6 \text{ m/s}}{6.0 \text{ m}} \\ f &= 0.93 \text{ Hz} \end{aligned}$$